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Assessing Gender Differences in Technological Pedagogical Content Knowledge (TPACK) among EFL High School Teachers in Inner Mongolia

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Abstract

This study examines gender differences in Technological Pedagogical Content Knowledge (TPACK) among 437 English as a Foreign Language (EFL) high school teachers in Inner Mongolia, China. Quantitative data revealed significant TPACK disparities between male and female teachers, with males exhibiting higher levels. The findings suggest that male teachers demonstrate greater confidence in integrating technology into their English classrooms. To address the TPACK gender gap, it is recommended that female EFL teachers receive specialized training through mentorship programs, online communities, and workshops. Policy changes are urged to create a collaborative, supportive, and inclusive digital environment for effective technology integration.

Keywords: TPACK; Gender Differences; EFL High School Teachers; Inclusive Support

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1.0 Introduction

In the dynamic landscape of education, the integration of technology has shifted from being a peripheral notion to a central focus for educators dedicated to enhancing learning experiences. To navigate this intricate terrain, Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework provides an invaluable roadmap. Rooted in Shulman's (1986) concept of the interconnectedness of Content Knowledge (CK) and Pedagogical Knowledge (PK), culminating in Pedagogical Content Knowledge (PCK), Mishra and Koehler (2006) underscore the essential inclusion of explicit Technological Knowledge (TK) as technology assumes an increasingly prominent role in classrooms.

The TPACK framework underscores the complex interplay among Pedagogical Knowledge (PK), Content Knowledge (CK), and Technological Knowledge (TK), leading to the emergence of intersecting pairs: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK). This emphasis on interconnected knowledge domains highlights the dynamic relationships between pedagogy, content, and technology, forming a comprehensive understanding essential for effective educational practices. The convergence of all three knowledge domains (PK, CK, and TK) is encapsulated in the term Technological Pedagogical Content Knowledge (TPACK). Figure 2, illustrating the TPACK Framework, can be referenced at the source:

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<http://tpack.org>. This framework serves as a comprehensive guide for educators navigating the multifaceted relationship between pedagogy, content, and technology in the educational landscape.

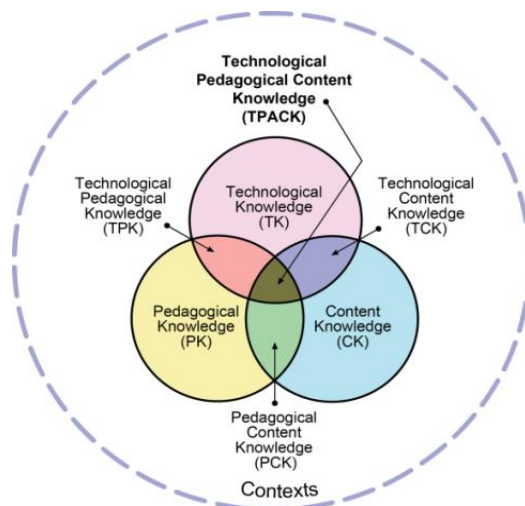


Figure 1. TPACK Framework Image (source: <http://tpack.org>)

Despite its widespread recognition, the TPACK framework's application in specific contexts, like high school English as a Foreign Language (EFL) classrooms, remains understudied. This gap is particularly concerning given the unique challenges and opportunities presented by language learning environments. Moreover, while TPACK research has largely overlooked the role of gender, growing evidence suggests it can significantly influence educators' technology integration practices.

The introduction of the TPACK framework by Mishra and Koehler (2006) has garnered substantial interest within the educational technology research community. While various tools have been developed to assess TPACK knowledge, there has been a notable oversight in considering the potential impact of gender on its evaluation, focusing on the proficiency and confidence of teachers in integrating technology into their pedagogical practices. This gap is concerning, given existing research highlighting the significant role of gender. This study aims to fill this void by examining the influence of gender in survey results from two cohorts of novice teachers.

2.0 Literature Review

Examining the impact of gender on the evaluation of Technological Pedagogical Content Knowledge (TPACK) knowledge is crucial, considering existing research on gender and educational technology, which highlights significant differences in attitudes toward TPACK. The literature regarding skills and usage holds particular significance, as these aspects are intricately linked with technology knowledge. Technology knowledge is defined as the comprehension of technologies and the adept application of this understanding (Harris, Mishra & Koehler, 2009). In light of the fundamental principles of the TPACK framework, where teachers seamlessly integrate their knowledge, the manner in which teachers evaluate their technology proficiency exerts a ripple effect on the interconnected domains of Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and, ultimately, Technological Pedagogical Content Knowledge (TPACK).

The impact of gender on teacher' ICT application is notable, with gender identity reflecting a person's internal sense of gender, which may not align with their physiology or assigned sex at birth. In education, male and female teachers exhibit distinct personalities; males tend to be more authoritative, while females often adopt softer and friendlier approaches. Emotional intelligence variations among male and female teachers contribute to differences in teaching styles. Numerous studies indicate that males generally possess a higher technological consciousness than females, impacting the integration of ICT in learning, particularly in the context of English as a Foreign Language (EFL), an aspect that requires further investigation.

Beyond individual characteristics, school-related factors, such as school status in Indonesia (state or private), can influence teachers' ability to integrate ICT, reflecting in their TPACK. State schools, directly managed by the government, undergo more direct intervention, including curriculum regulation (Sinaga, 2017). Differences in school status also impact the availability of ICT resources, with private schools often having more comprehensive facilities. However, not all educators effectively utilize these resources in their instructional processes. The impact of differences in ICT resource availability and autonomy in learning management on teachers' TPACK needs further exploration.

The combined influence of gender and school status affects teacher performance satisfaction, especially for junior high school English teachers. Existing studies on EFL teachers' TPACK primarily focus on pre-service teachers and lack information on gender and school status differences. Limited empirical research has targeted in-service EFL teachers, highlighting the need to assess the TPACK of those professionally employed in schools where technology incorporation occurs.

To address the gap in TPACK research in the EFL field, it is crucial to investigate how gender influences the mastery level of specific TPACK domains and their application in high school settings. This research aims to address both these gaps by focusing on male and female EFL high school teachers in Inner Mongolia, China. By analyzing differences in TPACK scores, self-reported proficiency, and observed technology integration practices through a gender lens, this study seeks to uncover nuanced insights applicable to tailoring professional development initiatives and fostering a more inclusive and equitable learning environment within the unique cultural and educational context of Inner Mongolia. Ultimately, this investigation holds the potential to enhance educational practices, benefiting both educators and students in EFL high schools around the world. To answer the research objectives, the research questions is:

Research Question 1: What is the significant mean difference in General TPACK with respect to gender among EFL high school teachers in Inner Mongolia, China?

Research Question 2: What is the significant mean difference in TPACK domains with respect to gender among EFL high school teachers in Inner Mongolia, China?

3.0 Methodology

In this study, a quantitative research design was employed to systematically investigate the application of the Technological Pedagogical Content Knowledge (TPACK) framework among English as a Foreign Language (EFL) high school teachers in Inner Mongolia. The study aimed to assess potential gender differences in TPACK levels, focusing on the proficiency and confidence of teachers in integrating technology into their pedagogical practices.

The chosen quantitative approach provided a structured and systematic means of collecting numerical data, allowing for statistical analysis to draw conclusions and make generalizations about the broader population. The choice to employ a customized TPACK Questionnaire as the survey instrument was based on its proven validity and reliability in prior research. The questionnaire underwent meticulous adaptation to ensure alignment with the unique context of EFL high school instruction in Inner Mongolia.

3.1 Participants

Initially, a total of 450 EFL high school teachers from various schools in Inner Mongolia were selected to respond to questionnaires based on the Krejcie and Morgan Table (Krejcie & Morgan, 1970). To ensure a representative sample that captured the diversity of EFL high school teachers across Inner Mongolia, a stratified random sampling technique was employed to select schools from various regions and districts within the province. Moreover, EFL high school teachers were voluntarily participated based on invitations, and teachers with different stage of teacher professional development including novice, experience, and expert teachers were considered.

3.2 Survey Questionnaire

The research objectives were pursued through the utilization of a survey method. In TPACK evaluation research, self-reporting is commonly employed due to its significant advantage in quantifying data and ensuring the reliability of scales. Consequently, we adapted the EFL-TPACK survey developed by Schmidt et al. (2009), a validated questionnaire that underwent a thorough validation process involving a substantial number of English experts and EFL teachers from Inner Mongolia. The validation process comprised three key phases: (1) a thorough expert review of the item pool, (2) conducting exploratory factor analysis (EFA), and (3) performing confirmatory factor analysis (CFA).

To align the questionnaire with the Inner Mongolia context and enhance instrument reliability, it was crucial to tailor the items to EFL teachers in the region. The survey comprised 39 items designed to explore the seven TPACK domains, utilizing a Likert scale ranging from "disagree" to "agree" with corresponding points from 1 to 5. The internal reliability coefficients of the survey are notably high.

3.3 Data Collection and Analysis

Data were collected via the modified TPACK instrument (Schmidt et al., 2009), distributed to the participants electronically, through Wenjuan Wang (<https://www.wenjuan.com>), an online platform for data collection. The questionnaire comprised items designed to gauge participants' technological knowledge, pedagogical practices, and content-specific integration of technology. Responses were collected on a five Likert scale, allowing for quantitative measurement of participants' self-reported TPACK levels.

Following data cleaning, 437 questionnaire is valid for further data analysis, statistical analyses were conducted using SPSS to explore potential gender differences in TPACK levels, an independent samples t-test was employed. This test compared the means for male and female teacher groups, revealing whether significant disparities existed in their self-assessed perception and utilization of technology within their EFL teaching practices. By providing insights into nuanced gender-specific variations in TPACK application, the t-test identified potential areas for tailored professional development initiatives. A significance level of 0.05 was set to ensure statistical significance of any observed differences.

4.0 Findings

The quantitative analysis, utilizing the T-test in the study of Technological Pedagogical Content Knowledge (TPACK) among English as a Foreign Language (EFL) high school teachers in Inner Mongolia, unearthed noteworthy gender differences in TPACK levels. The T-test was employed to compare the means of TPACK scores between male and female teachers. The results revealed statistically significant differences, indicating that the perceived proficiency and confidence in integrating technology into teaching practices were notably higher among male teachers compared to their female counterparts.

4.1 Research Question 1: What is the significant mean difference in General TPACK with respect to gender among EFL high school teachers in Inner Mongolia, China?

Table 1. Gender Difference in TPACK

Gender	Number	Mean	Std. Deviation	t	df	f	p
Male	66	3.65	0.408	8.400	435	21.756	0.000**
Female	371	2.97	0.634				

In Table 1 “Gender Difference in General TPACK”, the independent t-test explained general TPACK scores between male and female EFL high school teachers in Inner Mongolia ($t=8.400, p<0.01$). The male teachers ($M=3.65, SD=0.408$) have higher level of general TPACK than the female high school teachers ($M=2.97, SD=0.634$) in Inner Mongolia.

4.2 Research Question 2: What is the significant mean difference in TPACK domains with respect to gender among EFL high school teachers in Inner Mongolia, China?

Table 2. Gender Difference in TPACK Domains

Domains	Gender	Number	Mean	Std. Deviation	t	df	f	p
TK	Male	66	3.52	.937	.022	5.828	5.304	0.000**
	Female	371	2.88	.786				
CK	Male	66	3.57	.780	.168	4.631	1.906	0.000**
	Female	371	3.01	.927				
PK	Male	66	3.50	.749	.434	4.801	.613	0.000**
	Female	371	2.98	.821				
PCK	Male	66	3.62	.748	.636	4.662	.224	0.000**
	Female	371	3.10	.842				
TPK	Male	66	3.79	.793	.914	7.26	.012	0.000**
	Female	371	2.96	.872				
TCK	Male	66	3.68	.773	.145	5.998	2.134	0.000**
	Female	371	2.94	.950				
TPACK	Male	66	3.86	.676	.506	8.742	.444	0.000**
	Female	371	2.91	.837				

In Table 2, “Gender Differences in TPACK Domains,” reveals statistically significant differences ($p < 0.01$) in TPACK levels between male and female teachers across all domains (Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Pedagogical Knowledge (TCK), TPACK). Notably, male teachers consistently scored higher than female teachers in every TPACK domain, particularly in the technology-related TPACK domains (TK, TPK, TCK, and TPACK). These findings suggest that gender plays a role in teachers' technology proficiency and confidence, and male teachers appear to demonstrate greater competence and enthusiasm in applying the TPACK framework to integrate technology into their EFL classrooms.

In summary, the results from Tables 1 and 2 indicate that, across various components, male high school teachers exhibit greater proficiency in TPACK than their female counterparts. Male teachers, in particular, demonstrated the highest mastery, notably in TCK, with a mean score of 3.79. Conversely, female teachers showed the lowest TPACK mastery, specifically in the TK component, with a mean score of 2.88.

5.0 Discussion

The findings are in line with existing literature on gender disparities in technology and education. Research conducted by Guppy et al. (2022) and Rainey et al. (2023) consistently indicates that females tend to express lower levels of confidence and perceived proficiency in technology compared to their male counterparts. Specifically, the results of this study reveal that female EFL teachers in high schools generally exhibit less proficiency in technology use than their male colleagues.

Furthermore, the inferential analysis data indicates a significant overall difference in TPACK mastery between male and female English teachers, covering six components. This suggests that teachers' knowledge varies based on their gender. These outcomes are

in agreement with various other studies, illustrating that gender significantly influences the proficiency in PK, CK, PCK, TCK, and TPK (Nordin, Davis & Ariffin, 2013; Cahyani, Azizah & Evans, 2021; Irwanto, Redhana & Wahono, 2022; Abubakir & Alshaboul, 2023).

Additionally, Tømte (2010) posits that gender primarily affects attitudes towards ICT, aligning with the test results showing a substantial difference in technology knowledge (TK) between female and male teachers. This highlights an increasing gap in ICT use between genders. Several studies have consistently demonstrated a significant relationship between gender and ICT (Aesaert & Van Braak, 2015; Basavaraja & Sampath Kumar, 2017; Maheshwari, Gupta, Sinha & Rawat, 2020). Despite the widespread accessibility of technology to both genders, the growing number of women using ICT contributes to a widening gender gap in ICT utilization.

6.0 Conclusion & Recommendations

The quantitative results revealing significant gender differences in Technological Pedagogical Content Knowledge (TPACK) among English as a Foreign Language (EFL) high school teachers in Inner Mongolia necessitate a nuanced interpretation. This section delves into the implications of the findings, explores potential reasons for the observed gender differences, and contextualizes the results within the broader literature on gender and technology in education.

The identified TPACK gender gap suggests that, on average, female EFL high school teachers in Inner Mongolia perceive themselves to be less proficient and confident in integrating technology into their teaching practices compared to their male counterparts. These findings carry significant implications for educational practice and policy.

Firstly, the observed disparities underscore the need for targeted professional development programs that specifically address the technological, pedagogical, and content knowledge of female teachers. Customized training initiatives can empower female educators, enhance their confidence in utilizing technology, and ultimately contribute to a more equitable distribution of TPACK skills.

Additionally, mentorship programs, collaborative workshops, and online communities tailored to the needs of female teachers can provide crucial support and a platform for knowledge exchange. These initiatives can foster a sense of community and address potential barriers that contribute to the observed TPACK gender gap.

From a policy perspective, the results call for a reevaluation of institutional policies to ensure equitable access to technological resources and opportunities for professional growth. By acknowledging and actively addressing the disparities identified in this study, educational institutions can work towards creating an environment that fosters gender-inclusive technology integration.

The limitation of this study lies in the sample of the participants. As the study followed a snowball sampling method, the resulting sample may not be a good representative of the EFL high school teachers in Inner Mongolia. As a result, the study's generalizability is limited.

Paper Contribution to Related Field of Study

This study investigated gender differences in the application of the Technological Pedagogical Content Knowledge (TPACK) framework among English as a Foreign Language (EFL) high school teachers in Inner Mongolia. The key findings revealed notable disparities in TPACK levels between male and female educators. Female teachers reported lower confidence levels and perceived proficiency in integrating technology into their teaching practices compared to their male counterparts. The research underscores the importance of addressing these gender differences to promote equitable access to and effective use of technology in EFL education.

The implications of this study extend beyond the specific context of EFL high school teaching in Inner Mongolia, offering valuable insights for educational practice and policy globally. The identified TPACK gender gap highlights the need for targeted interventions in professional development, mentorship, and policy formulation to empower female educators in technology integration.

For educational practice, institutions should consider implementing gender-sensitive training programs, mentorship initiatives, and collaborative platforms that support the development of TPACK skills among all teachers. Policies should be revised to ensure equitable access to technological resources and opportunities for professional growth.

Future research should delve deeper into understanding the underlying factors contributing to the TPACK gender gap, considering cultural, societal, and institutional influences. Exploring the impact of specific interventions, such as tailored training programs and mentorship initiatives, on narrowing this gap can provide valuable insights for refining strategies. Additionally, investigating the intersectionality of gender with other demographic factors, such as age and teaching experience, can contribute to a more nuanced understanding of the complexities involved.

Furthermore, as technology and education continue to evolve, future research should explore the dynamic nature of TPACK and how it intersects with emerging educational technologies. Investigating the evolving roles of male and female educators in adapting to technological advancements will inform the development of strategies that remain relevant in the face of ongoing changes in the educational landscape.

In conclusion, addressing the TPACK gender gap is not only a matter of equity but a strategic imperative for enhancing the quality of education. By implementing targeted interventions informed by ongoing research, educational institutions can foster an inclusive and innovative environment where all educators, regardless of gender, are empowered to effectively integrate technology into their teaching practices.

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